PATENT ABSTRACTS OF JAPAN

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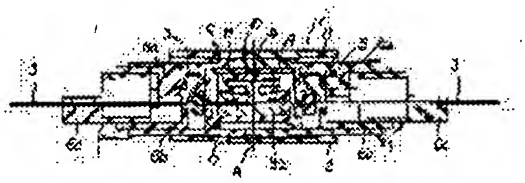
(71)Applicant : JAPAN AVIATION ELECTRON IND LTD
NIPPON TELEGR & TELEPH CORP <NTT>
(72)Inventor : YAMASHITA MAKOTO
MURAKAMI KEIJI
ANDO YASUHIRO

(54) MULTI-FIBER OPTICAL CONNECTOR

(57)Abstract:
PURPOSE: To provide the multi-fiber optical connector which prevents disalignment and the angular deviation and is % small-sized and has a high performance.
CONSTITUTION: A pair of plugs 1 are provided with first flat springs 5, which apply loads to front end faces from the rear of a ferrule 4, and plug members 6 which hold the ferrule 4 and first flat springs 5, and an adapter 2 is provided with a V groove member 8 for connection of the ferrule 4, a second flat spring 9 which presses the ferrule 4 to a v groove 8a or the groove member 4, a holding member 10 which holds the groove part 8 and the second flat spring 9, and a floating member 11 which holds the holding member 10 in the floating state.



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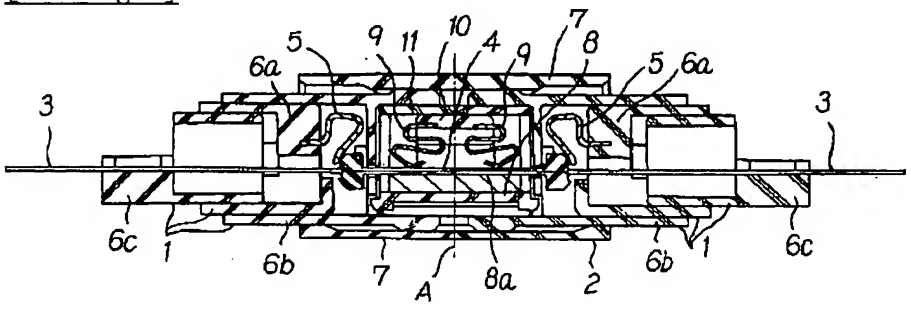
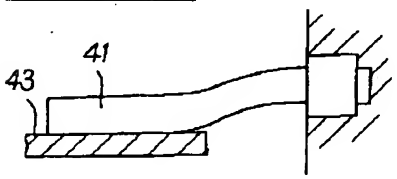
* NOTICES *

DRAWINGS

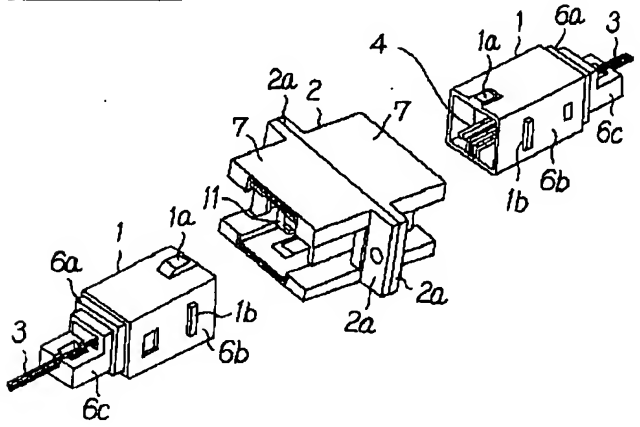
[Drawing 4]



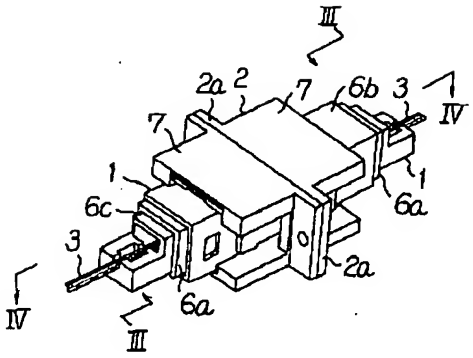
[Drawing 13]



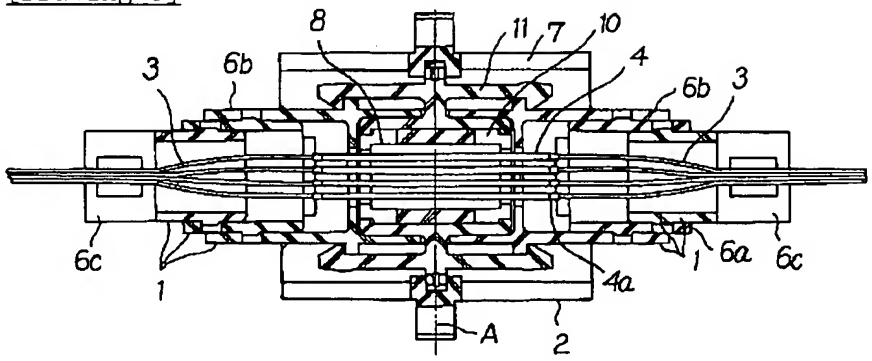
[Drawing 1]



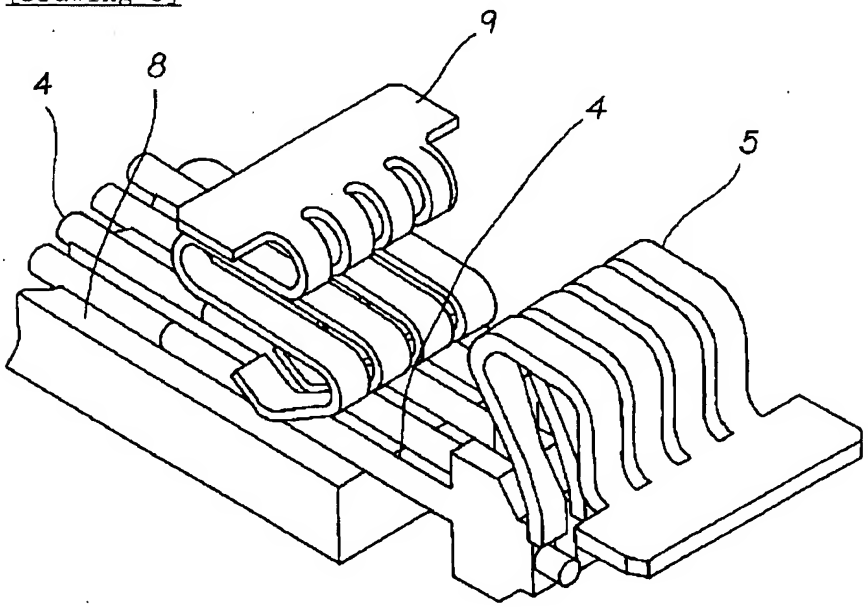
[Drawing 2]



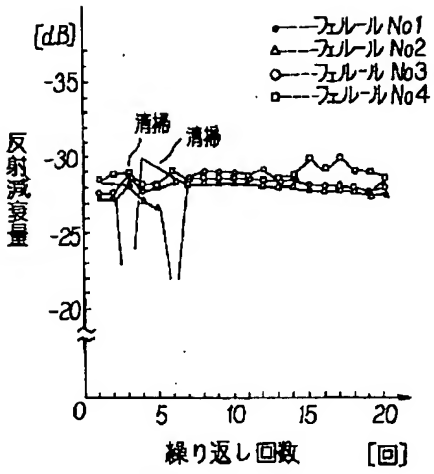
[Drawing 3]



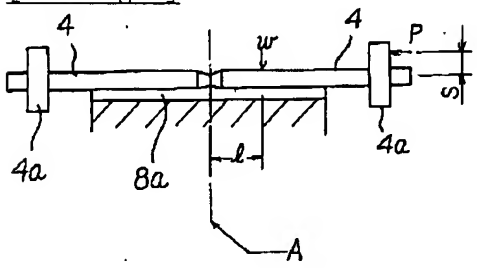
[Drawing 5]



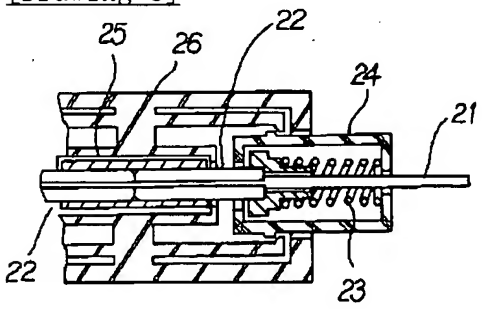
[Drawing 7]



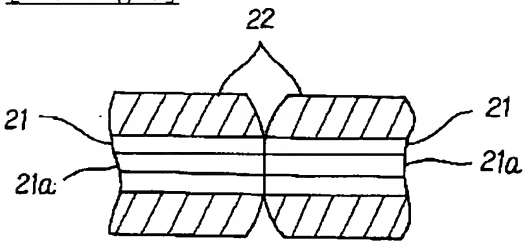
[Drawing 6]



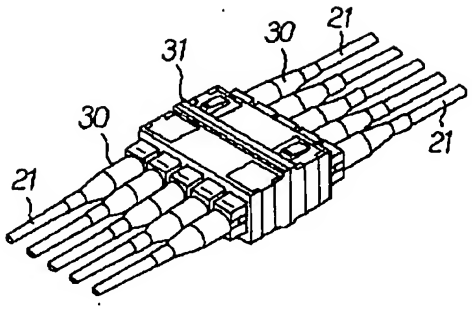
[Drawing 8]



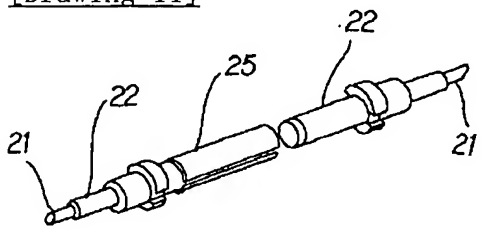
[Drawing 9]



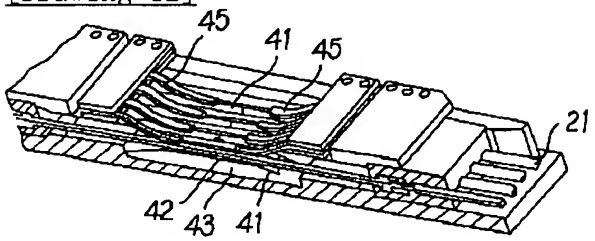
[Drawing 10]



[Drawing 11]



[Drawing 12]



[Translation done.]

* NOTICES *

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the appearance perspective view in which showing one example of the optical connecter of this invention, and showing the condition in front of fitting of an optical connecter.
[Drawing 2] It is the perspective view showing the condition after fitting of the optical connecter of drawing 1 .
[Drawing 3] III-III of the optical connecter of drawing 2 It is a line sectional view.
[Drawing 4] It is the IV-IV line sectional view of the optical connecter of drawing 2 .
[Drawing 5] It is the expansion perspective view showing the detail of the 1st and 2nd springs and V groove which were shown in drawing 4 .
[Drawing 6] It is the model Fig. for analysis of the optical connecter of this invention.
[Drawing 7] It is the graph which indicates a measurement result with a count repeatedly to be the value of the return loss in the optical connecter of this invention.
[Drawing 8] It is the sectional view showing the important section of the conventional single fiber optical connecter.
[Drawing 9] It is the sectional view showing the connection of the conventional optical fiber.
[Drawing 10] It is the perspective view showing the configuration of the ferrule using the conventional split sleeve.
[Drawing 11] It is the perspective view showing the condition after fitting of the conventional multicore optical connecter.
[Drawing 12] It is the strabism sectional view showing the multicore optical connecter of the conventional V groove method.
[Drawing 13] It is the conceptual diagram of the multicore optical connecter of the V groove method of drawing 12 .
[Description of Notations]
1 Plug
2 Adapter
3 21 Optical fiber
4 22 Ferrule
5 1st Flat Spring

6a Plug member
7 Adapter Case
8 Slot Material
8a, 42 V groove
9 2nd Flat Spring
10 26 Attachment component
11 Floating Member
23 Coil Spring
25 Sleeve
45 Push Member

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the optical multicore connector which connects an optical fiber removable especially about the optical connecter for connecting two or more optical fibers to one to one.
[0002]
[Description of the Prior Art] As a conventional optical connecter, as shown in drawing 8 , the single fiber optical connecter which adopted the sleeve method is known. This single fiber optical connecter has the 1st attachment component 24 of the pair for holding a coil spring 23, and the ferrule and coil spring for adding a load from the back of the ferrule 22 by which it was pasted up by the optical fiber 21 and it was ground, and this ferrule 22, the sleeve 25 of the shape of slitting for connecting each ferrule 22, and the 2nd attachment component 26 for holding a sleeve 25.
[0003] With this optical connecter, when the 1st attachment component 24 of a pair fits into the 2nd attachment component 26, the amount of [of a ferrule 22] point carries out elastic deformation, and the core section of the optical fiber 21 pasted up on the ferrule 22 is connected within a sleeve 25 in the condition of having been stuck completely.
[0004] In addition, since the reflective return light generated by connection of an optical connecter may have a bad influence on the transmission system of an optical fiber 21, in current, many optical connecters of PC connection type are used. PC connection is a method which connects core section 21a of an optical fiber 21 in the condition near optical connection by adding a load and carrying out elastic deformation of the ferrule 22 end face from the back of the ferrule 22 containing an optical fiber, as shown also in drawing 9 and drawing 10 . In order to make PC connection of the ferrule 22 in the condition of having been stabilized within the split sleeve 25, it is required to specify the load of a coil spring 23 and the holding power of a split sleeve 25 in a certain fixed range.
[0005] Moreover, the multicore optical connecter which connects mutually five optical fibers 21 as shown in drawing 11 other than the single fiber optical connecter shown in drawing 8 is known. This multicore optical connecter connects an optical fiber 21 mutually by fitting the plug 30 of a pair into an adapter 31.
[0006] In addition, as an optical connecter, as shown in drawing 12 and drawing 13 , the optical connecter of a method which connects a ferrule by V Mizogami is

known. Connection of the optical fiber 21 in this optical connecter consists of a ferrule 41 manufactured by resin material etc., and the slot material 43 which has V groove 42 and the push member 45. The ferrule 41 inserted in V groove 42 is structure which is respectively forced by the push member 45, and is stuck and held in V groove 42 by it so that it may align an optical-axis comrade within V groove 42.

[0007] This optical connecter is the structure characterized [greatest] by aligning the ferrule 41 currently made by the resin material in which elastic deformation is possible on V groove 42, and connecting. Therefore, the variations at the time of manufacture of the components which constitute a plug and an adapter (tolerance etc.) are absorbed with the elasticity of a ferrule 41, and connection is made.

[0008]

[Problem(s) to be Solved by the Invention] However, since the conventional optical connecter is the structure where the ferrule 22 by which it was pasted up by the optical fiber 21 and it was ground is connected within a sleeve 25 after the load has been added by the coil spring 23 from back, when connecting the optical fiber 21 of the number of multicore, an optical fiber 21 needs the sleeve 25 of the same quantity to two or more ferrules 22 pasted up and ground.

[0009] In the conventional optical connecter, there is a problem that many components are needed as it is very difficult to miniaturize more than [a certain] fixed and an optical fiber 21 becomes the number of multicore.

[0010] Moreover, there is a problem that elastic deformation of the point of a ferrule 22 is carried out in the optical connecter which a ferrule 22 deforms plastically and is connected on V groove 42, and it is very difficult to make it connect where the core section of an optical fiber 21 is stuck completely, and it cannot carry out to below fixed [that exists also when miniaturizing an optical connecter, since it is the structure of adding a load by the coil spring from back].

[0011] So, the technical problem of this invention is by setting up so that it may be in the condition of connecting a ferrule by V Mizogami using the 1st spring and 2nd spring, and the core section of an optical fiber sticking completely in a ferrule at the time of fitting, and not carrying out an imperfect alignment and an include-angle gap to offer an optical connecter highly efficient at low cost with few component parts small.

[0012]

[Means for Solving the Problem] Two or more ferrules which according to this invention it was equipped with the optical fiber and ground, The plug member holding the 1st spring and this 1st spring for adding a load from the back of this ferrule, The V groove for connecting said ferrule, and the 2nd spring for suppressing said ferrule to said V groove, When it consists of an adapter for holding said V groove and said 2nd spring and said plug member of a pair fits in with said adapter, The optical multicore connector characterized by connecting said ferrule by said V Mizogami in an imperfect alignment and the condition that a tip carries out elastic deformation and the core section of said optical fiber sticks completely, without carrying out an include-angle gap is obtained.

[0013] Moreover, according to this invention, the optical multicore connector characterized by the member holding said V groove carrying out floating is

obtained.
[0014]
[Function] It is positioned in the V groove of a ferrule fang furrow member, and the core section of an optical fiber is connected mutually. the core section of the optical fiber pasted up on the ferrule -- perfect -- sticking -- a part for and the point of a ferrule -- an imperfect alignment -- and it sticks, without carrying out an include-angle gap. By fitting into a floating member and an attachment component, the tip of a ferrule carries out elastic deformation of the plug member of a pair, and a load which the core section of the optical fiber pasted up on the ferrule sticks completely is added to a ferrule by the 1st flat spring.
[0015] That is, a load is added by the 1st flat spring from back, respectively, and the ferrule which pastes up an optical fiber, grinds and is held is connected after having been pressed down by V Mizogami of slot material by the 2nd flat spring, respectively. At this time, the attachment component holding a V groove and the 2nd flat spring is in floating. The apical surface of a ferrule connects the 2nd flat spring in an imperfect alignment and the condition of having been pushed against the V groove of slot material, without carrying out an include-angle gap.
[0016] Thus, two or more ferrules are connected by V Mizogami, and a ferrule end face carries out elastic deformation by the 1st flat spring, a load which the core section of the optical fiber fixed to the ferrule (adhesion) sticks completely is added, and a high-density and highly efficient optical multicore connector is realized by the optical multicore connector in which a load which an imperfect alignment and an include-angle gap do not generate in a connection by the 2nd flat spring had the connection type added to a ferrule.
[0017]
[Example] An optical multicore connector has the effective method which considers as the method which carries out the high density (miniaturization) of two or more optical fibers, and connects a ferrule by V Mizogami. Moreover, in order to make connection (high performance) of reflective return light which is in a connection, it is required to stick completely the core section of the optical fiber which was made to carry out elastic deformation of the ferrule end face, and was fixed to the ferrule (adhesion).
[0018] Therefore, a ferrule (narrow diameter ferrule) is connected by V Mizogami as one connection type for realizing a highly efficient optical multicore connector with high density, and a ferrule end face carries out elastic deformation by the 1st flat spring, a load is added so that the core section of the optical fiber fixed to the ferrule may stick completely, and the optical multicore connector in which a ferrule has an imperfect alignment and the connection conditions which do not carry out an include-angle gap by the 2nd flat spring can be considered.
[0019] This example describes a narrow diameter ferrule below using the above-mentioned connection type about the optical multicore connector at the time of connecting in 1mm pitch by V Mizogami.
[0020] Drawing 1 thru/or drawing 4 show one example of the optical multicore connector of this invention. With reference to drawing 1 and drawing 2 , the optical connecter of this invention has the adapter 2 which fits in removable and

connects these plug members 1 with the plug 1 of a pair. The plug 1 of a pair is connected removable by fitting these into an adapter 2.

[0021] Furthermore, as shown in drawing 3 thru/or drawing 5 , plug member 6a by which the 1st flat spring 5 which adds a load to the comparison apical surface of a ferrule 4, and a ferrule 4 and the 1st flat spring 5 are held is prepared in each of the plug 1 of a pair from the back of two or more ferrules 4 which held two or more optical fibers 3 to one to one, and a ferrule 4.

[0022] The adapter case 7 where the adapter 2 was mutually made combining the case member currently formed in 2 cracks, The slot material 8 by which V groove 8a of the shape of V character for connecting a ferrule 4 is formed in the interior of this adapter case 7, It has the attachment component 10 by which a flat spring 9, and the 2nd slot material 8 and 2nd flat spring 9 for suppressing a ferrule 4 to up to V groove 8a of the slot material 8 are held, and the floating member 11 which holds an attachment component 10 where floating is carried out.

[0023] In addition, each of the plug 1 of a pair has fiber attaching part 6c which penetrates and holds tubed outer frame section 6b by which two or more heights 1a and 1b which hold plug member 6a inside, and engage with the adapter case 7 are formed outside, and an optical fiber 3, and is held at plug member 6a. These are put together mutually and plug member 6a, outer frame section 6b, and fiber attaching part 6c constitute one plug 1.

[0024] Moreover, flange 2a projected outside is formed from the side face, and by doubling flange 2a mutually, the case member currently formed in 2 cracks is combined mutually, and it is fixing to the adapter case 2.

[0025] That is, a load is added by the 1st flat spring 5 from back, respectively, and four ferrules 4 by which it was pasted up by the optical fiber 3 and it was ground are connected in the condition of having been pressed down on slot 8a of the slot material 8 by the 2nd flat spring 9, respectively. At this time, the attachment component 10 holding the slot material 8 and the 2nd flat spring 9 is in floating. The 2nd flat spring 5 achieves the duty which the apical surface of a ferrule 4 connects in an imperfect alignment and the condition of having been pushed against slot 8a, without carrying out an include-angle gap.

[0026] The 1st flat spring 5 required in order to carry out elastic deformation of the end face of a ferrule 4 is the structure of having the structure of pushing only one side (above) of the flange of a ferrule 4, and pushing a ferrule 4 by the piece of a spring according to individual, respectively in order to connect a ferrule 4 to high density on slot 8a. Moreover, it has the structure of suppressing a ferrule 4 by the piece of a spring according to individual like the 1st flat spring also about the 2nd flat spring 9 which suppresses a ferrule 4 on V groove 8a.

[0027] Moreover, in a setup as shown in drawing 6 , in order for the core of an optical fiber 3 to stick completely, after the ferrule 4 has been forced by V groove 8a, it connects. In drawing 6 R> 6, P is a load added to a ferrule 4 by the 1st flat spring 5. S is the distance from the core of a ferrule 4 to the load point of the 1st flat spring 5. W is a load added when forcing a ferrule 4 on V groove 8a by the 2nd flat spring 9. l is the distance from the optical datum plane (connecting location of a ferrule 4) A to the load point of the 2nd flat spring 9. These relation serves as PS<=Wl.

[0028] However, Load P changes with classes (for example, a single mode fiber, a

multimode fiber, etc.) of optical fiber 3.
[0029] Moreover, the result which shows the connection condition of 4 heart optical connecter which built a prototype in this structure is shown in drawing 7. As criteria showing a connection condition, it measured about the ferrule 4 of the value of return loss [dB], 20 counts of a repeat, and the 4 heart. Consequently, it turns out that connection by which return loss was stabilized between -26--30[dB] in the connection part in an optical master side was made.
[0030]
[Effect of the Invention] As mentioned above, as the example explained, according to the optical connecter of this invention, a small and highly efficient optical connecter is realizable by setting up the 1st flat spring and the 2nd flat spring so that it may be in the condition of giving floating structure to the attachment component holding the 2nd flat spring and slot material, and the core section of an optical fiber sticking completely in a ferrule at the time of fitting, and not carrying out an imperfect alignment and an include-angle gap.
[0031] Moreover, in the optical connecter of this invention, since there are few component parts compared with the conventional optical connecter, the effectiveness that a low cost optical connecter is realizable is done so.

[Translation done.]

CLAIMS

[Claim(s)]
[Claim 1] Two or more ferrules which it was equipped with the optical fiber and ground, and the 1st spring for adding a load from the back of this ferrule, The plug member holding this 1st spring, and the V groove for connecting said ferrule, When it consists of an adapter for holding a spring, and said the 2nd V groove and said 2nd spring for suppressing said ferrule to said V groove and said plug member of a pair fits in with said adapter, The optical multicore connector characterized by connecting said ferrule by said V Mizogami in an imperfect alignment and the condition that a tip carries out elastic deformation and the core section of said optical fiber sticks completely, without carrying out an include-angle gap.
[Claim 2] The optical multicore connector characterized by the member holding said V groove carrying out floating in an optical multicore connector according to claim 1.

[Translation done.]